

REMARKS

Claims 17-22, 24-29 and 31 are pending in the subject application. No claims have been indicated to be allowable.

Claim 31 was added by the herein amendment to replace previously canceled Claim 23. No new matter has been added by the herein amendment to the claims.

Applicants wish to thank Examiner Ildebrando for the personal interview held on November 20, 2003, at the U.S. Patent and Trademark Office with attorney, Beverly J. Artale, and inventors, Terry G. Roberie and Michael S. Ziebarth. During the interview the specific teaching of the Vasalos reference which teaches away from the use of vanadium on a molecular sieve catalyst was pointed out to the Examiner as well as evidence which show that at the time of the Vasalos invention it was known by one skilled in the FCC art that vanadium poisoned the catalytic activity and selectivity of a molecular sieve cracking catalyst. The Examiner agreed to consider Applicants' arguments once filed in a written response.

35 USC 103

Claims 17-18, 21-22 and 24-27 stand rejected under 35 USC 103(a) as being unpatentable over Vasalos et al. This rejection is respectfully traversed.

As stated in the Amendment dated April 20, 2003 and herein restated, Applicants' invention as now claimed comprises a fluidizable catalytic cracking product sulfur reduction catalyst comprising a porous molecular sieve component having a first vanadium metal component and a second metal component comprising cerium located in the pores of the molecular sieve component. The catalyst is useful to reduce the sulfur content of liquid products produced during a fluidized catalytic cracking process.

Vasalos et al. relates to catalytic materials which are useful for the reduction of gaseous carbon monoxide (CO) and sulfur oxide (SO_x) gases emitted from FCC regenerators (column 3, lines 31-33) during a FCC process. The reference is silent with respect to reducing the sulfur content of products produced during an FCC process. The catalytic material disclosed in Vasalos et al. may be

in the form of solid particles which contain a molecular sieve type catalytic cracking catalyst such as a zeolite (column 3, lines 39-45; column 9, lines 47-48, line 63 et seq.). The material also contains a "metallic reactant" (column 4, lines 24-26) which reacts with sulfur oxide gas to form a metal and sulfur containing compound. In addition, a "metallic promoter" or "metallic oxidation promoter" can be present for the oxidation of carbon monoxide and sulfur oxide; this component is separate from the "metallic reactant" (column 4, lines 29, 36-37; column 6, lines 4-6, 18-22; column 14, lines 32-33, 40-42, 63-64; column 15, lines 7, 12-15; column 20, lines 9-13) and may be vanadium.

The metallic reactant and the metallic promoter may be present as a powder separate from the sieve type cracking catalyst (column 13, lines 62-68). Alternatively, the metallic reactant and/or metallic promoter may be incorporated onto a suitable support (column 14, line 33) which is then admixed with the sieve type cracking catalyst (column 14, lines 39-42). Such support can be an amorphous cracking catalyst or a solid which is substantially inert to the cracking reaction.

A decision to maintain or withdraw a rejection requires consideration of all the evidence of record. See *In re Eli Lilly & Co.*, 902 F. 2d 943; 14 U.S.P.Q.2d 1741 (Fed. Cir. 1990). The totality of the evidence includes not only the facts derived from the *Graham* inquires, but also any rebuttal evidence as submitted the Applicant, as well as the teaching of the prior art reference as a whole.

The key teaching in Vasalos et al. as it relates to Applicants' invention lies in the requirement by Vasolas et al. that the metallic promoter and metallic reactant must be "**inert**" toward the cracking reaction and that the high cracking activity normally present in the molecular sieve catalyst remain "**substantially unaffected**" by the presence of either the metallic promoter or reactant. (See Col. 8, line 65 to Col. 9, line 4 and Co. 13, lines 55-58 of Vasalos et al). Thus, where Vasalos et al. teaches that the metallic promoter or metallic reactant or both may be incorporated into a sieve type cracking catalyst (column 14, lines 47-51), Vasalos et al. goes on to teach that when the metallic components are introduced on a molecular sieve type cracking catalyst, the metallic components should be introduced in a manner which is "**inert**" and does not **adversely affect** the cracking activity and selectivity of the cracking catalyst (column 14, lines 55-58).

Applicants' invention as now claimed requires the inclusion of vanadium metal as the first metal component on a molecular sieve component comprising the catalyst. **However, it was well known in the FCC art at the time of Vasalos invention that the presence of vanadium on a molecular sieve cracking catalyst resulted in a loss of both catalytic activity and selectivity.** See "Vanadium Poisoning of Cracking Catalyst: Mechanism of Poisoning and Design of Vanadium Tolerant Catalyst System" Journal of Catalyst, Vol. 100, pgs. 130-137 (1986); U.S. Patent 3,711,422, Johnson et al., issued January 16, 1973; U.S. 3,977,963, Readal et al., issued August 31, 1976; and "Metal Resistant Fluid Cracking Catalysts" ACS Symposium Series, Chapter 21, pg 343 (1990)(as submitted with the Amendment dated May 20, 2003). It is clear from the teaching of these references that one skilled in the art would have expected at the time of Applicants' invention and the Vasalos et al. invention that the inclusion of vanadium on the molecular sieve cracking catalyst would not be "**inert**" but would **adversely affect the catalytic performance** of the cracking catalyst. Consequently, it is believed that the Vasalos et al. reference teaches one skilled in the art away from placing vanadium on a molecular sieve cracking catalyst.

Consequently, it is believed that Vasalos et al. teaches that where the metallic promoter is vanadium, vanadium is not placed on the molecular sieve cracking component as claimed by applicant, but rather is placed on an alternative support such as an amorphous cracking catalyst, or a solid which is substantially inert to the cracking reaction, i.e., alumina, to avoid loss of cracking activity and/or selectivity.

This position is clearly supported by of the Examples of the Vasalos et al. reference. Examples 1-16 and 18-21, as disclosed in Vasalos et al., provide metals other than vanadium on a molecular sieve type cracking catalyst. Only Example 17 discloses the use of **vanadium** and only Example 17 teaches impregnating the metal on a support other than a cracking catalyst, i.e. an alumina. **There are no Examples which indicate that vanadium was incorporated directly into or onto a molecular sieve component.**

Accordingly, it is believed that Vasalos et al. teaches away from Applicant's invention as now claimed, by requiring that the metal promoter and metal reactant on the molecular sieve be "**inert**" and have "**substantially no**" affect on the catalytic activity of the molecular sieve type catalyst. Further, it is

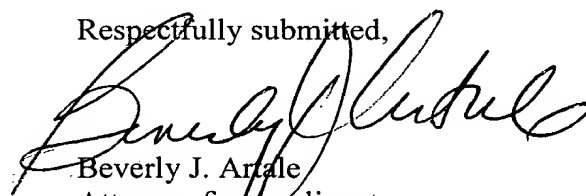
believed that Applicants have presented rebuttal evidence to show that one skilled in the art at the time of Vasalos et al. would not have expected that vanadium on a molecular sieve catalyst would be **"inert"** but rather would have expected a **loss of both catalytic activity and selectivity of the catalyst**. Consequently, it is believed that Applicants' invention is patentable and unobvious over the teachings of Vasalos et al. **as a whole**. Withdrawal of this rejection is therefore respectfully requested.

Claims 19-20 and 28-29 stand rejected under 35 USC 103(a) as being unpatentable over Vasalos et al. as applied to claims 17-18, 21-22 and 24-27 above, and further in view of Chu or Miller. This rejection is respectfully traversed.

The Chu and Miller et al. references have been relied upon by the Examiner to show that conventional cracking catalyst include large pore zeolites such as zeolite Y in its ultrastable form and Y-type zeolite such as USY. Neither reference however teaches or in any way suggests the inclusion of vanadium metal in the pores of a molecular sieve type cracking catalyst, whether a USY or a zeolitic cracking catalyst, to provide a catalyst composition suitable to reduce the sulfur content of products produced during the catalysis process. Consequently, this rejection is not proper and should now be withdrawn.

For reasons as stated herein above, reconsideration of Applicants' invention as patentable over the prior art of record and allowance of claims 17-22, 24-29 and 31 in the subject application is respectfully requested.

Respectfully submitted,



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